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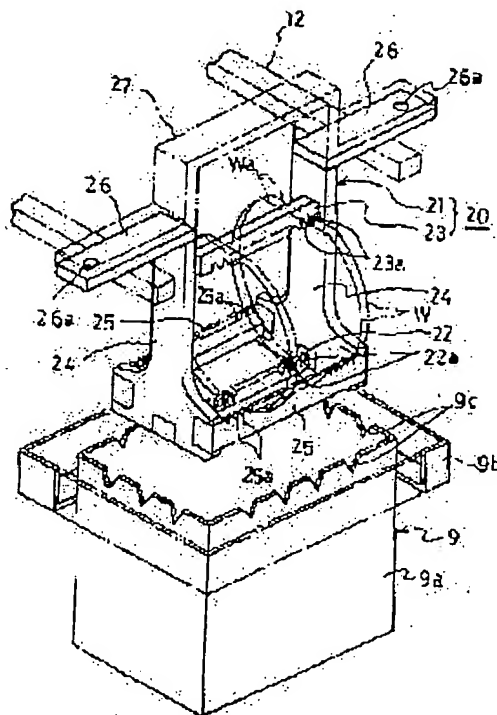
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(54) WASHING TREATMENT DEVICE

(57)Abstract:

PURPOSE: To make an inter-substrate pitch small and to support the substrates in a stable state by forming a retaining member having grooves of the same pitch as the pitch of the holding grooves of a holding member in a position where the holding member faces the substrates attachably and detachably to and from the substrates.

CONSTITUTION: A wafer supporting member 20 is composed of a wafer carrier 21 which has the holding member 22 provided with the plural holding grooves 22a for supporting the wafers W in parallel with each other at the specific pitch and the retaining member 23 which has the grooves 23a of the same pitch as the pitch of the holding grooves 22a of the holding member 22 in the position where the holding member 22 faces attachably and detachably to and from the wafers W. The orientation flat parts Wa of the wafers W are engaged with the



inside of the grooves 23a of the retaining member 23 when the wafers W are held at the holding member 22 and an auxiliary holding member 25. As a result, the contact of the adjacent wafers W with each other during transportation does not arise. The size of the device is reduced and the consumption of a washing liquid is reduced.

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CLAIMS

[Claim(s)]

[Claim 1] In the washing processor possessing the washing processing
tub for washing a washed substrate, and the support means which

supports a washed substrate that the above-mentioned washed substrate should be carried in in this washing processing tub the above-mentioned support means The attachment component which prepared mutually two or more retention groove holding the above-mentioned washed substrate in parallel in the predetermined pitch, The washing processor characterized by having provided the presser-foot member which has the retention groove of an attachment component, and the slot of the same pitch that the above-mentioned washed substrate should be held by this attachment component and the part which counters, and forming the above-mentioned presser-foot member in the above-mentioned washed substrate possible [engaging and releasing].

[Claim 2] In the washing processor possessing the washing processing tub for washing a washed substrate, a carrying-in / taking-out means to carry in or take out the above-mentioned washed substrate in this washing processing tub, and the support means that supports the washed substrate carried in in the above-mentioned washing processing tub The attachment component which prepared mutually in parallel two or more retention groove to which the above-mentioned support means holds the above-mentioned washed substrate in the predetermined pitch, The washing processor characterized by having provided the presser-foot member which has the retention groove of an attachment component, and the slot of the same pitch that the above-mentioned washed substrate should be held by this attachment component and the part which counters, and forming the above-mentioned presser-foot member in the above-mentioned washed substrate possible [engaging and releasing].

[Claim 3] The washing processor according to claim 1 or 2 which constitutes the retention groove of an attachment component, and the slot of a presser-foot member from a slot base which holds edge both sides of a washed substrate, respectively, and the dip advice section extended to one side of the opening edge of this slot base, and is characterized by prepare the above-mentioned dip advice section in the side by the side of the position of symmetry on the diagonal line in the above-mentioned retention groove and slot which counter in this case.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the washing processor which is immersed in a predetermined penetrant remover and carries out washing processing of the washed substrate.

[0002]

[Description of the Prior Art] Generally, this kind of washing processor carries out sequential immersion of a washed substrate (a wafer is told to below), for example, the semi-conductor wafer, at processing liquid, such as ammonia, fluoric acid, and pure water, and carries out washing processing of the front face of a wafer.

[0003] It conveys as this kind of a washing processor conventionally the whole wafer carrier which held two or more wafers, for example, 25 sheets. The washing processor constituted so that sequential immersion might be carried out and it might wash to a washing processing tub, Two or more wafers, for example, 25 sheets, picked out from the wafer carrier are conveyed to each washing processing tub etc. with a wafer conveyance arm, and the so-called washing processor of carry Ares which delivers to the wafer boat (wafer support means) arranged in each washing processing tub, and carries out washing processing is known.

[0004] By the way, a semiconductor device tends to be integrated highly in recent years, and the circuit pattern is being increasingly made detailed. Moreover, a semi-conductor wafer tends to be diameter[of macrostomia]-ized from 6 inches to 8 inches. In order to raise versatility, the wafer carrier which holds the wafer of such a diameter of macrostomia of 8 inch, for example, a diameter, is constituted so that 25 wafers may be held in the usually unified pitch (the wafer of the diameter of 6 inch 4.76mm), for example, 6.35mm. For this reason, while conveying the wafer the whole wafer carrier, enlarging the washing processing tub in the washing processor of the former which carries out sequential immersion at a washing processing tub etc. and the whole

equipment's becoming large-sized, there was a problem that the amount of the pure water used increased.

[0005] In order to solve the above-mentioned problem, the applicant developed the washing station which enabled it to aim at the cutback of consumption, such as a miniaturization of equipment, and a penetrant remover, by establishing the wafer installation slot of a pitch narrower than the pitch of a wafer carrier in a wafer support means (refer to JP,5-129267,A).

[0006]

[Problem(s) to be Solved by the Invention] However, when the pitch of a wafer was made not much small, during conveyance, the wafer shake-came to be easy and changed into the unstable condition, and as shown in drawing 13, there was a problem that the wafers they Wafer W inclines during conveyance or adjoins contacted. Moreover, since spacing of adjoining wafers was narrow, the penetrant remover L collected among Wafers W and W with surface tension between wafers, even after pulling up Wafer W from a washing processing tub, the penetrant remover L adhered to Wafer W, and the problem of causing trouble was also in washing processing. Such a phenomenon especially will appear notably, if in the case of the penetrant remover of a hydrophilic property and the pitch between wafers is set to 4.8mm or less. Therefore, the actual condition is having not resulted, by the time it cannot make the pitch between wafers not much narrow but can satisfy enough the miniaturization of equipment, and the cutback of the amount of the penetrant remover used. In addition, in the washing processor of a carry Ares type, although the volume part washing processing tub of a wafer carrier can be somewhat made small as compared with the washing processor conveyed the whole wafer carrier and the cutback of the amount of the penetrant remover used can be aimed at, since a limitation is in the pitch of a wafer supporter as mentioned above, by the time it can satisfy enough the miniaturization of equipment, and the cutback of the amount of the penetrant remover used as mentioned above also in this, it will not have resulted.

[0007] This invention can perform washing processing to a stable condition in support of a washed substrate, and aims at offering the washing processor which enabled it to aim at the miniaturization of equipment, and the cutback of the amount of the penetrant remover used while it was made in view of the above-mentioned situation and makes the pitch between processed substrates small as much as possible.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned object, the 1st washing processor of this invention It is premised on the washing processor possessing the washing processing tub for washing a washed substrate, and the support means which supports a washed substrate that the above-mentioned washed substrate should be carried in in this washing processing tub. The attachment component which prepared mutually in parallel two or more retention groove to which the above-mentioned support means holds the above-mentioned washed substrate in the predetermined pitch, It is characterized by having provided the presser-foot member which has the retention groove of an attachment component, and the slot of the same pitch that the above-mentioned washed substrate should be held by this attachment component and the part which counters, and forming the above-mentioned presser-foot member in the above-mentioned washed substrate possible [engaging and releasing] (claim 1).

[0009] Moreover, a washing processing tub for the 2nd washing processor of this invention to wash a washed substrate, A carrying-in / taking-out means to carry in or take out the above-mentioned washed substrate in this washing processing tub, It is premised on the washing processor possessing the support means which supports the washed substrate carried in in the above-mentioned washing processing tub. The above-mentioned support means The attachment component which prepared mutually two or more retention groove holding the above-mentioned washed substrate in parallel in the predetermined pitch, It is characterized by having provided the presser-foot member which has the retention groove of an attachment component, and the slot of the same pitch that the above-mentioned washed substrate should be held by this attachment component and the part which counters, and forming the above-mentioned presser-foot member in the above-mentioned washed substrate possible [engaging and releasing] (claim 2).

[0010] Although that configuration may be arbitrary in this invention as long as the retention groove of the above-mentioned attachment component and the slot of a presser-foot member are formed in this pitch, preferably The slot base which holds edge both sides of a washed substrate for the retention groove of an attachment component, and the slot of a presser-foot member, respectively, It is better to constitute from the dip advice section extended to one side of the opening edge of this slot base, and to prepare the above-mentioned dip advice section in the side by the side of the position of symmetry on the diagonal line in

the above-mentioned retention groove and slot which counter in this case (claim 3).

[0011]

[Function] According to the washing processor of this invention constituted as mentioned above, a support means The attachment component which prepared mutually two or more retention groove holding a washed substrate in parallel in the predetermined pitch, By providing the presser-foot member which has the retention groove of an attachment component, and the slot of the same pitch that a washed substrate should be held by this attachment component and the part which counters, and forming a presser-foot member in a washed substrate possible [engaging and releasing] Since the opposite part of a washed substrate can be held by the attachment component and the presser-foot member, a washed substrate is conveyed in a location predetermined in the condition of having not shaken carelessly during conveyance and having been stabilized. Moreover, since it can prevent that a washed substrate bends according to an operation of the surface tension of a penetrant remover during washing processing, a penetrant remover does not collect among adjoining washed substrates. Therefore, the pitch between washed substrates can be made small as much as possible, and the miniaturization of equipment and the cutback of the amount of the penetrant remover used can be aimed at (claims 1 and 2).

[0012] Moreover, while constituting the retention groove of an attachment component, and the slot of a presser-foot member from a slot base which holds edge both sides of a washed substrate, respectively, and the dip advice section extended to one side of the opening edge of this slot base, by preparing the dip advice section in the side by the side of the position of symmetry on the diagonal line in the retention groove and slot which counter, a washed substrate is guided at the dip advice section, and is held easily for a slot base, and certainly. Moreover, since the dip advice section is prepared only in the side of the position of symmetry on the diagonal line of the retention groove which counters, and a slot, the pitch of the retention groove and a slot can be made small still as much as possible, and the miniaturization of equipment and the cutback of the amount of the penetrant remover used can be aimed at further (claim 3).

[0013]

[Example] The example of this invention is explained at a detail based on a drawing below. This example explains the case where it applies to the

washing processor of a semi-conductor wafer.

[0014] O As for first example drawing 1 , the outline perspective view of the first example of the washing processor of this invention is shown, and, as for drawing 2 , conveyance of a washed substrate and the perspective view of a processing state are shown.

[0015] As the washing processor of a semi-conductor wafer is shown in drawing 1 , the body consists of the carrying-in section 1 which holds the semi-conductor wafer (a wafer is told to below) W which is an unsettled washed substrate, the washing processing section 2 which performs washing processing of Wafer W, and the taking-out section 3 which holds the wafer W after washing.

[0016] The standby section 5 which makes the cassette 4 by which the carrying-in section 1 holds the number W of predetermined leaves before washing processing, for example, 25 wafers, stand by, The pitch translator 6 transferred to the wafer carrier 21 which changes the ejection of the wafer W from a cassette 4, and the pitch between Wafers W into a predetermined pitch, and constitutes the wafer support means 20, It comes to provide the cassette conveyance arm 7 for transporting a cassette 4 between migration in the standby section 5 of the cassette 4 carried in by the carrier robot etc. from the exterior and this standby section 5, and the pitch translator 6.

[0017] It goes to the washing processing section 2 from the carrying-in section 1 at the taking-out section 3. In the shape of a straight line in order 1st chuck washing / desiccation processing room 8a which washes and dries the chuck 12 for wafer carrier conveyance, 1st drug solution processing room 8b which carries out washing processing of the quality of an impurity, such as an organic contamination of a wafer W front face, a metal impurity, and particle, with a drug solution, The wafer W washed by 1st drug solution processing room 8b For example, two rinsing processing rooms 8c and 8d washed with pure water, 2nd drug solution processing room 8e washed with a different drug solution from the drug solution of 1st drug solution processing room 8b, The wafer W washed by 2nd drug solution processing room 8e For example, two rinsing processing rooms 8f and 8g washed with pure water, Wafer desiccation processing room 8i for carrying out steam seasoning of the wafer W from which 2nd chuck washing / desiccation processing room 8h and the above-mentioned quality of an impurity which wash and dry a chuck 12 were removed by IPA (isopropyl alcohol) etc. is arranged. In each [these] washing processing room (only henceforth processing room) 8a-8h, the processing tub 9 is arranged, respectively.

[0018] moreover, the advice section 10 arranged in the side of the washing processing section 2 along each processing rooms 8a-8i and this advice section 10 are equipped -- having -- a horizontal (the direction of X) -- and -- being vertical (Z direction) -- the wafer carrier transport device 15 which consists of three sets of the wafer carrier conveyance blocks 11 which can move freely is formed. The chuck 12 holding the wafer carrier 21 which sets two or more wafers W suitably, and carries out successive installation support of the spacing is formed in the wafer conveyance block 11, and it is constituted so that the wafer carrier 21 and Wafer W which are held by this chuck 12 may be conveyed at each processing rooms 8a-8i.

[0019] In addition, the carrier conveyance section 13 which conveys an empty carrier and a full carrier is formed above the washing processing section 2. Moreover, the processing liquid and the piping hold room 14 containing the tank which holds processing liquid, such as a drug solution, or a piping group are established in the tooth-back side of the washing processing section 2.

[0020] The above-mentioned wafer support means 20 consists of a wafer carrier 21 which has the attachment component 22 which prepared mutually two or more retention-groove 22a holding Wafer W in parallel in the predetermined pitch, and a presser-foot member 23 engaged removable to the wafer W which has slot 23a of the same pitch as retention-groove 22a of an attachment component 22 that Wafer W should be held by the attachment component 22 and the part which counters.

[0021] In this case, the wafer carrier 21 constructs across an attachment component 22 horizontally between the lower centers of the support plate 24 of the couple of an abbreviation reverse T typeface, and about an attachment component 22, it comes to construct across the auxiliary attachment component 25 horizontally between the upper parts a little, and it comes to protrude on the up edge of a support plate 24, respectively, as shown in drawing 2 and drawing 3 in the outward flange material 26 of both sides. Mounting hole 26a is prepared in the flange material 26, it fixes with the bolt which does not illustrate the hat-like grasping fixture 27 laid on this flange material 26, and it is constituted so that an operator may have the wafer carrier 21 in a hand and can convey it. Thus, each configuration member of the wafer carrier 21 constituted is formed for example, in the member made from a quartz excellent in chemical resistance and corrosion resistance. In addition, the attachment component 22 and the auxiliary attachment component

25 are being fixed to the support plate 24 by welding etc.

[0022] Moreover, retention-groove 22a prepared in an attachment component 22 consists of a slot base 30 holding the ends side of Wafer W of a cross-section U shape, and the dip advice section 31 which can stab at the both sides of the opening edge of the slot base 30 in the shape of extension, as shown in drawing 4 . Thus, by forming retention-groove 22a, it can be made to be able to show the edge of the wafer W carried in to the wafer carrier 21 to the inclined plane of the dip advice section 31, it can be certainly shown into the slot base 30, and Wafer W can be held. In addition, retention-groove 25a of the shape of a triangle as shown in the auxiliary attachment component 25 at drawing 5 is prepared in retention-groove 22a of an attachment component 22, and this pitch.

[0023] On the other hand, the above-mentioned presser-foot member 23 is formed for example, in the member made from a polyether ether ketone (Polyetheretherketone;PEEK) excellent in anticorrosion, a heatproof, and reinforcement-proof nature. Moreover, slot 23a which the member made of a fluororesin and the member made from a quartz are sufficient as the presser-foot member 23, and is prepared in this presser-foot member 23 It consists of a slot base 30 holding the ends side of Wafer W of a cross-section U shape, and the dip advice section 31 which cuts in the shape of extension to the both sides of the opening edge of the slot base 30, and is lacked in them like retention-groove 22a of an attachment component 22 (refer to drawing 5). Thus, by forming slot 23a, it can be carried in to the wafer carrier 21, the inclined plane of the dip advice section 31 can guide the orientation flat section Wa of the upper part of the wafer W held by the attachment component 22 and the auxiliary attachment component 25, it can show around certainly into the slot base 30, and the upper bed section of Wafer W can be held.

[0024] Thus, the presser-foot member 23 constituted is formed in the orientation flat Wa section of the upper part of the wafer W transferred to the wafer carrier 21 by the presser-foot member conveyance device 40 prepared in the near location of the above-mentioned pitch translator 6 possible [engaging and releasing]. As shown in drawing 3 , the presser-foot member conveyance device 40 supports the presser-foot member maintenance arm 42 of the shape of a hollow pipe which has the adsorption section 41 of the presser-foot member 23 at a head possible [****] toward the wafer carrier 21 from the side of the wafer carrier 21 with the **** means which is not illustrated, and comes to connect

vacuum devices (not shown) with the base of the presser-foot member maintenance arm 42.

[0025] Thus, in case Wafer W is taken out for Wafer W by the wafer carrier 21 from carrying in or the wafer carrier 21, by actuation of vacuum devices, the presser-foot member conveyance device 40 constituted carries out adsorption maintenance of the presser-foot member 23, stands up to a position in readiness (continuous-line location of drawing 3), and becomes the obstacle of carrying in and taking out of Wafer W. And after Wafer W was carried in to the wafer carrier 21 and Wafer W was held by the attachment component 22 and the auxiliary attachment component 25, The presser-foot member maintenance arm 42 rotates to a wafer W upper part side, and makes the orientation flat section Wa of Wafer W engaged in slot 23a of the presser-foot member 23. Then, after suspending actuation of vacuum devices and canceling adsorption of the presser-foot member 23 by the adsorption section 41, the presser-foot member maintenance arm 42 is retreated to a position in readiness.

[0026] Therefore, while the lower part is held by an attachment component 22 and the auxiliary attachment component 25, the wafer W carried in to the wafer carrier 21 Since the upside orientation flat section Wa is held by the presser-foot member 23 When the wafer W which shakes and inclines during conveyance or adjoins, and W do not contact, a penetrant remover collects among the wafers W and W which Wafer W bends and adjoin with the surface tension of a penetrant remover during washing processing, or there is no problem of Wafer W contacting.

[0027] In addition, although the above-mentioned explanation explained the case where retention-groove 22a of an attachment component 22 and slot 23a of the presser-foot member 23 were constituted from a slot base 30 holding the ends side of Wafer W of a cross-section U shape, and the dip advice section 31 which can stab at the both sides of the opening edge of the slot base 30 in the shape of extension also ** (ing) -- retention-groove 22a of an attachment component 22, and slot 23a of the presser-foot member 23 with the U-shaped slot base 32 which holds both sides of Wafer W, respectively, as it is not necessary to consider as such structure and is shown in drawing 6 It constitutes from the dip advice section 33 extended to one side of the opening edge of this slot base 32, and you may make it form the dip advice section 33 in the side by the side of the position of symmetry on the diagonal line in retention-groove 22a and slot 23a which counter in this case.

[0028] Thus, while being able to make the pitch P between slots small as much as possible by constituting retention-groove 22a and slot 23a, maintenance of Wafer W can be made easily and reliable. That is, the dip advice section 33 can be made to be able to meet, insertion to Mizouchi of Wafer W can be made easy, and the edge where Wafer W counters with the side attachment wall 34 of the dip advice section 33 which counters on the diagonal line, and the slot base 32 of an opposite hand can be held certainly. Thus, it is possible by constituting retention-groove 22a and slot 23a to set up the pitch P between slots small to about 2mm.

[0029] The above-mentioned pitch translator 6 consists of a wafer transfer device 60, and $1/2$ pitch wafer guide 61 (it specifically forms on the wafer carrier 21), as shown in drawing 7. In this case, the wafer transfer device 60 is constituted so that the periphery section of each wafer W may be grasped from both sides with the supporter 62 of a thick thin pectinate form, and these supporters 62 are usually formed in the pitch (the wafer of the diameter of 8 inch 6.35mm). On the other hand, $1/2$ pitch wafer guide 61 possesses the wafer support slot 63 formed so that Wafer W could usually be supported by $1/2$ of a pitch, i.e., 3.175mm pitch.

[0030] Thus, in order to change the pitch between wafers using the pitch translator 6 constituted, the wafer W held in [of one] cassette * is first grasped and conveyed according to the wafer transfer device 60, and it lays in $1/2$ pitch wafer guide 61. In this condition, Wafer W is arranged alternately in the wafer support slot 63 of $1/2$ pitch wafer guide 61.

[0031] Next, like the graphic display arrow head A, $1/2$ pitch wafer guide 61 is moved horizontally $1/2$ pitch, i.e., 3.175mm, and according to the wafer transfer device 60, the wafer W held in another cassette 4 is grasped and conveyed, and it inserts and lays between the wafers W of $1/2$ pitch wafer guide 61 after this. Thereby, 50 wafers W are arranged in 3.175mm pitch on $1/2$ pitch wafer guide 61 21, i.e., a wafer carrier. And as mentioned above, according to the presser-foot member conveyance device 40, the presser-foot member 23 moves, the upper part W_a , i.e., the orientation flat, of the wafer W carried in to the wafer carrier 21, and the upper bed section of Wafer W is similarly held in 3.17mm pitch.

[0032] In addition, although the above-mentioned explanation explained the case where the wafer W of the diameter of 8 inch was made into $1/2$ [of the usual pitch] pitch, it can apply similarly to the wafer of other

paths of 6 inch, for example, a diameter, and a pitch can be suitably chosen not only from 1/2 of the usual pitch but from the usual pitch a small pitch, for example, 4.8mm, 3.5mm, or 2.0 etc.mm. In this case, in order to carry out the pitch of Wafer W 1 / except 2 pitches, the pitch translator 6 as shown in drawing 8 can be used. As shown in drawing 9, the upper part this pitch translator 6 usually Namely, the pitch Pa (for example, 6.35mm) The lower part is made into the request pitch Pb (for example, mm [4.8], mm [3.5], or 2.0mm). The wafer support device 65 which has the wafer support slot 64 formed from the upper part so that a pitch might become narrow gradually towards the lower part, and grasps the periphery section of Wafer W from both sides, It consists of wafer guides 66 (specifically formed on the wafer carrier 21) which support Wafer W in the request pitch Pb (for example, mm [4.8], mm [3.5], or 2.0mm).

[0033] Thus, in order to carry out the pitch of wafer spacing 1 / except 2 pitches using the constituted request pitch translator 6, the wafer W usually arranged in the pitch is supported first in the upper part of the wafer support device 65, and these wafers W are conveyed in the upper part of the wafer guide 66. And by extending spacing of the wafer support device 65 gradually, as Wafer W falls so that it may slide on the inside of the wafer support slot 64, it changes into a request pitch. And it lays on the wafer guide 66 (specifically wafer carrier 21) in this condition. If such a pitch translator 6 is used, it is usually convertible not only for 1/[of a pitch] 2 pitch but a desired pitch.

[0034] In addition, as shown in drawing 2 and drawing 10, outside tub 9b is prepared in the periphery section of up opening of processing tub body 9a, and the processing tub 9 in the above 1st and the 2nd drug solution processing room 8b and 8e becomes it, and it is constituted so that the drug solution L (penetrant remover) overflowed from processing tub body 9a through notch 9c prepared in opening of processing tub body 9a may be caught by outside tub 9b. Moreover, 9d of circulation ducts is connected to the pars basilaris ossis occipitalis of processing tub body 9a, and the pars basilaris ossis occipitalis of outside tub 9b, and it is constituted so that circulation supply of the drug solution L overflowed by outside tub 9b through pump 9e [which is interposed in 9d of this circulation duct] and bulb 9f and filter 9g may be carried out into processing tub body 9a. On the other hand, the processing tub 9 of the four above-mentioned rinsing processing rooms 8c, 8d, 8f, and 8g supplies a lot of pure water in the washing processing layer 9 from the pure-water supply source which comes to connect and does not

illustrate 9h of pure-water supply-cum-drain pipes at the pars basilaris ossis occipitalis of the washing processing layer 9 as shown in drawing 11 , and the so-called quick discharge method which drains the pure water after processing at once for a short time is adopted after predetermined-time progress.

[0035] Next, actuation of the washing processor of this invention is explained. First, after conveying the wafer W changed into the desired pitch on the wafer carrier 21 and holding by the above-mentioned pitch translator 6 in retention-groove 22a of an attachment component 22, and retention-groove 25a of the auxiliary attachment component 25, according to the presser-foot member conveyance device 40, the presser-foot member 23 is made to engage with the orientation flat Wa of Wafer W, and the upper part of Wafer W is held.

[0036] Next, the wafer carrier 21 is conveyed to 1st drug solution processing room 8b by the chuck 12, predetermined time immersion of the wafer carrier 21 and the wafer W is carried out at the drug solution in the processing tub 9, and washing processing of the quality of an impurity, such as an organic contamination of a wafer W front face, a metal impurity, and particle, is carried out with a drug solution. Next, sequential conveyance of the wafer carrier 21 is carried out at the rinsing processing rooms 8c and 8d, and the drug solution which was immersed in the pure water in the processing tub 9, and was used by 1st processing room 8b is removed. Subsequently, the wafer carrier 21 is conveyed to 2nd drug solution processing room 8e, predetermined time immersion of the wafer carrier 21 and the wafer W is carried out at the drug solution in the processing tub 9, and a different drug solution from the drug solution of 1st drug solution processing room 8b washes Wafer W. And after carrying out sequential conveyance and washing the wafer W washed by 2nd drug solution processing room 8e in the rinsing processing rooms 8f and 8g, the wafer carrier 21 is conveyed to wafer desiccation processing room 8i, and steam seasoning of the wafer W from which the quality of an impurity was removed is carried out by IPA (isopropyl alcohol) etc. Under the present circumstances, it is more desirable to remove the presser-foot member 23 from Wafer W, to convey the wafer carrier 21 in wafer desiccation processing room 8i, and to carry out desiccation processing, in order to prevent *****, since the stain pattern of an IPA steam etc. arises into the part which the presser-foot member 23 in Wafer W contacts.

[0037] Pitch conversion is carried out to it having been conveyed by the taking-out section 3 and having mentioned above by the pitch translator

6 by actuation of reverse, and 25 wafers W with which washing processing and desiccation processing were performed as mentioned above are held at a time in two cassettes 4, usual pitch, for example, 6.35mm pitch.

[0038] Therefore, since Wafer W is conveyed in the condition of having been held by the attachment component 22 and the presser-foot member 23, it does not shake and incline during conveyance or contiguity does not contact. Moreover, since washing processing of the wafer W can be carried out where small pitch spacing is held, a penetrant remover can collect between the wafers which adjoin so that the upper part of Wafer W may not bend with the surface tension of a penetrant remover during washing processing, or it can prevent that wafers contact. Furthermore, while being able to miniaturize the processing tub 9, consequently the standup of the specific resistance of the ion in pure water becoming early in rinsing processing and rinse effectiveness's improving by holding Wafer W at intervals of a small pitch, it not only can shorten rinse time amount (washing processing time), but it can reduce the amount of the pure water used.

[0039] O As for second example drawing 10, the outline sectional view of the important section of the second example of a washing processor is shown.

[0040] The second example is the case where it applies to the so-called washing processor of the carry Ares type which conveys the washing processor of this invention in a direct washing processing room, without using the wafer carrier 21 of the first example of the above.

[0041] Namely, after transferring the wafer W changed into the desired pitch in the wafer W held in the cassette 4 of the standby section 5 by the pitch translator 6 constituted like the first example of the above to the wafer guide 66, It is the case where grasp the wafer W by which pitch conversion was carried out, Wafer W is conveyed in each washing processing room, and washing processing is made to be carried out by the chuck 12 of the first example of the above, and the wafer chuck 16 as a carrying-in / taking-out means arranged similarly.

[0042] In this second example, the support means 20 holding the wafer W which received from the wafer chuck 16 and was passed is arranged in each processing tub 9. This support means 20 like the wafer carrier 21 of the first example of the above The support plate 54 of the couple of an abbreviation reverse T typeface, The wafer boat 51 which has one attachment component 52 constructed across horizontally by these support plates 54 and two auxiliary attachment components 55

constructed horizontally across the both sides of an attachment component 52, and carries out rise-and-fall migration of the inside of each processing tub 9. It consists of the same presser-foot members 23 as the first example of the above formed in the upper part of the wafer W held at the wafer boat 51 according to the presser-foot member conveyance device 40 arranged in the side of each processing tub 9 possible [engaging and releasing]. In addition, in the second example, since other parts are the same as the first example of the above, the same sign is given to the same part and the explanation is omitted.

[0043] The wafer W conveyed by the wafer chuck 16 by constituting as mentioned above. After the retention groove 52a and 55a of the attachment component 52 of the wafer boat 51 of each processing room and the auxiliary attachment component 55 was won popularity and passed, By the presser-foot member 23 moving to the upper part of Wafer W by actuation of the presser-foot member conveyance device 40, and making slot 23a of the presser-foot member 23 engage with the orientation flat Wa section. Alignment maintenance of the upper part and the lower part of Wafer W can be carried out at intervals of a predetermined small pitch, and washing processing can be performed in this condition.

[0044] Therefore, since washing processing of the wafer W can be carried out where small pitch spacing is held, a penetrant remover can collect between the wafers which adjoin so that the upper part of Wafer W may not bend with the surface tension of a penetrant remover during washing processing, or it can prevent that wafers contact. Moreover, like the first example of the above, while being able to shorten rinse time amount (washing processing time), the amount of the pure water used can be reduced.

[0045] In addition, although the above-mentioned example explained the case where the washing processor of this invention was applied to the washing processor of a semi-conductor wafer, of course, it is applicable also to the washing processor of washed substrates, such as glass substrates other than a semi-conductor wafer, or a LCD substrate.

[0046]

[Effect of the Invention] Since it is constituted as mentioned above according to the washing processor of this invention as explained above, the following effectiveness is acquired.

[0047] 1) Since a washed substrate can be conveyed in a processing tub in the condition of having been stabilized since the opposite part of a washed substrate is held by the attachment component and the

presser-foot member, washing processing can be carried out and the pitch between washed substrates can moreover be made small as much as possible, the miniaturization of equipment and the cutback of the amount of the penetrant remover used can be aimed at.

[0048] 2) While constituting the retention groove of an attachment component, and the slot of a presser-foot member from a slot base which holds both sides of a washed substrate, respectively, and the dip advice section extended to one side of the opening edge of this slot base, a washed substrate can be held easily and certainly by preparing the dip advice section in the side by the side of the position of symmetry on the diagonal line in the retention groove and slot which counter. Moreover, since the dip advice section is prepared only in the side of the position of symmetry on the diagonal line of the retention groove which counters, and a slot, it can make the pitch of the retention groove and a slot small still as much as possible, and can aim at the miniaturization of equipment, and the cutback of the amount of the penetrant remover used further.

[Translation done.]

* NOTICES *

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3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline perspective view showing an example of the semi-conductor wafer washing processor which applied the washing processor of this invention.

[Drawing 2] It is the perspective view showing conveyance of a washed substrate and the processing state in the first example of the washing processor of this invention.

[Drawing 3] It is the outline sectional view of the support means of the

first example.

[Drawing 4] It is the sectional view showing the maintenance condition of the attachment component of the first example, and a presser-foot member.

[Drawing 5] It is the expanded sectional view showing the slot of the auxiliary attachment component in this invention.

[Drawing 6] It is the sectional view showing another retention form of the attachment component in this invention, and a presser-foot member.

[Drawing 7] It is the outline perspective view showing the pitch translator in this invention.

[Drawing 8] It is the outline perspective view showing another configuration of a pitch translator.

[Drawing 9] It is the outline side elevation showing the important section of the pitch translator of drawing 8 .

[Drawing 10] It is the outline sectional view of an example of the processing tub in this invention.

[Drawing 11] It is the outline sectional view showing another example of a processing tub.

[Drawing 12] It is the important section sectional view of the second example of this invention.

[Drawing 13] It is the outline sectional view showing the maintenance condition of the washed substrate in the conventional washing processor.

[Description of Notations]

W Semi-conductor wafer (washed substrate)

12 Chuck for Wafer Carrier Conveyance

16 Wafer Chuck (Carrying-in / Taking-Out Means)

20 50 Support means

21 Wafer Carrier

22 52 Attachment component

22a, 52a Retention groove

23 Presser-Foot Member

23a Slot

30 32 Slot base

31 33 Dip advice section

34 Side Attachment Wall

51 Wafer Boat

*NOTICES *

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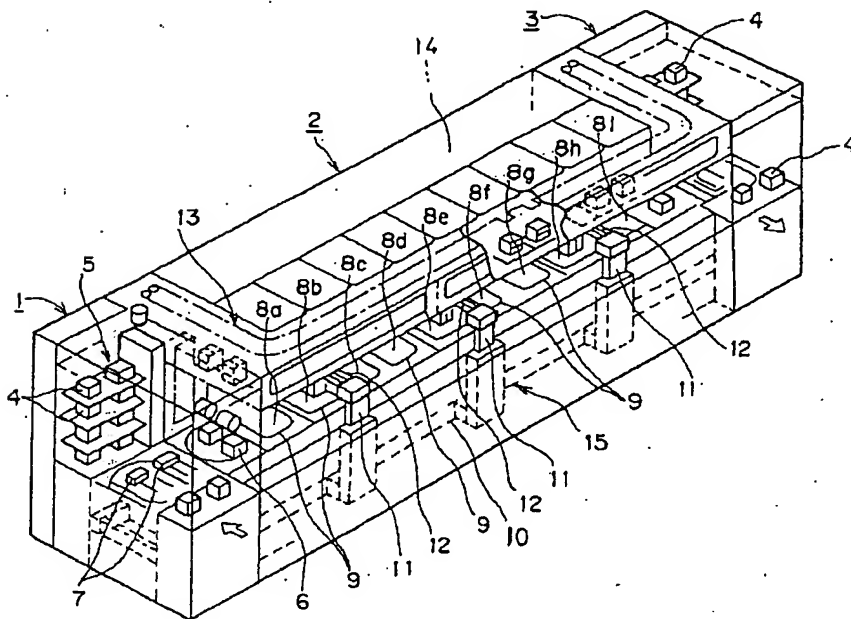
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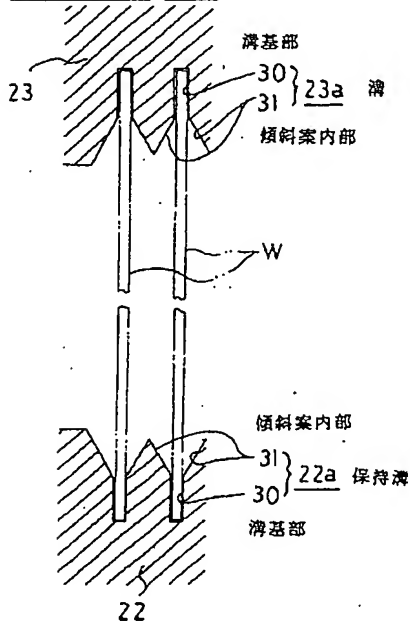
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DRAWINGS

[Drawing 1]



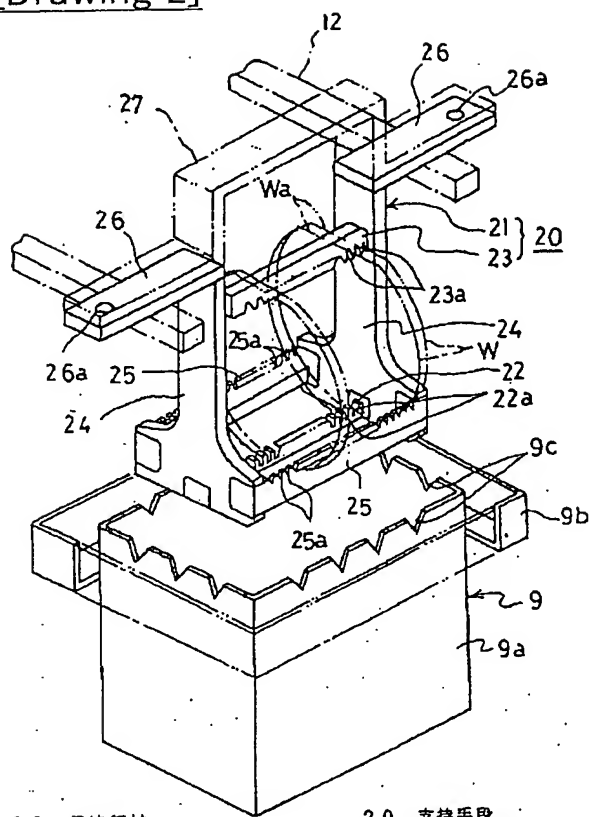
[Drawing 4]



[Drawing 5]

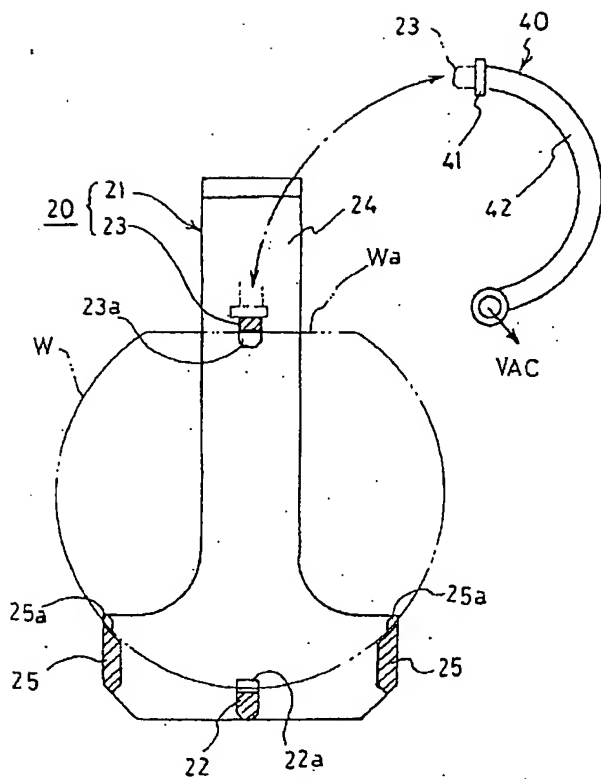


[Drawing 2]

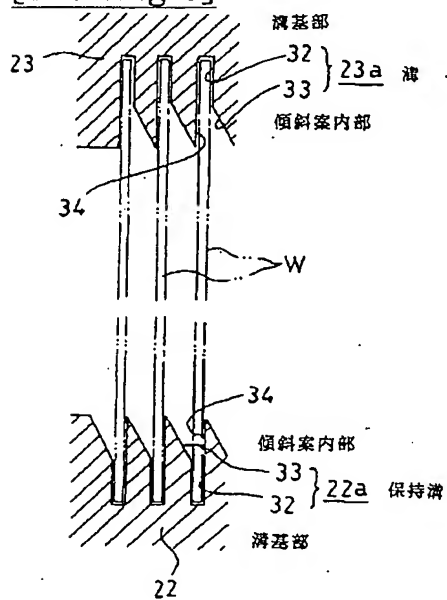


- | | |
|----------|------------|
| 22 保持部材 | 20 支持手段 |
| 22a 保持溝 | 21 ウエハキャリア |
| W 半導体ウエハ | 23 押え部材 |
| | 23a 溝 |

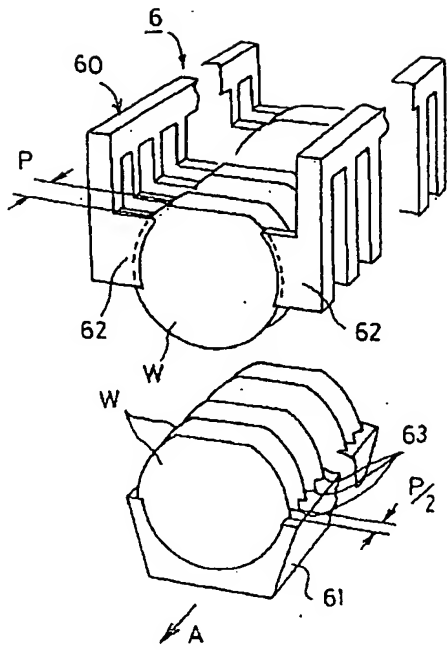
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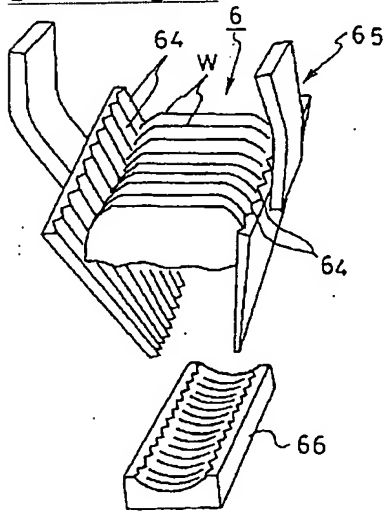
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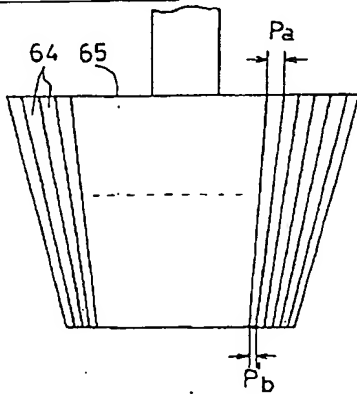
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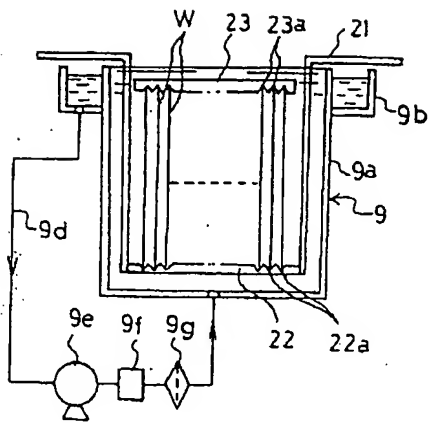
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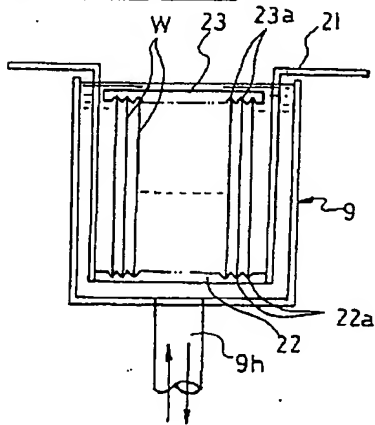
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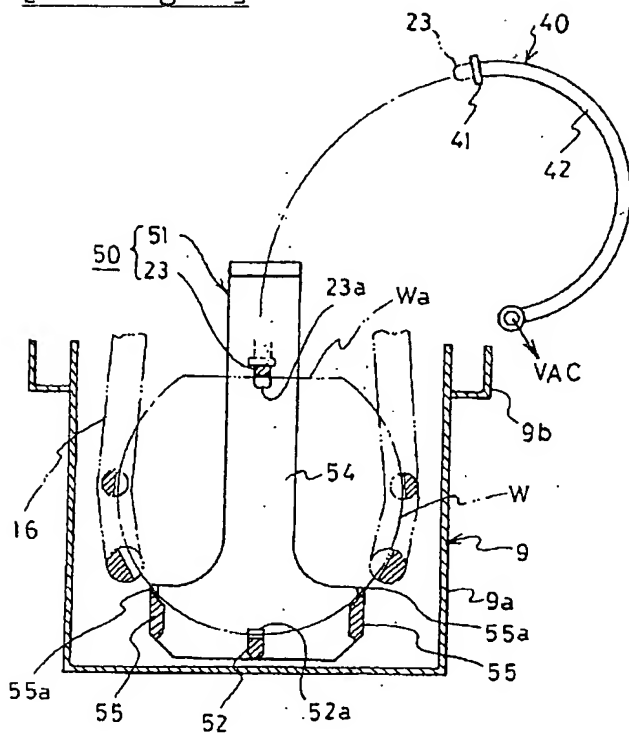
[Drawing 10]



[Drawing 11]

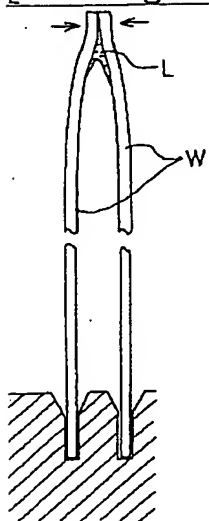


[Drawing 12]



- | | |
|------------|-----------|
| 16 ウエハチャック | 51 ウエハポート |
| 23 押え部材 | 52 保持部材 |
| 50 支持手段 | 52a 保持溝 |

[Drawing 13]



[Translation done.]

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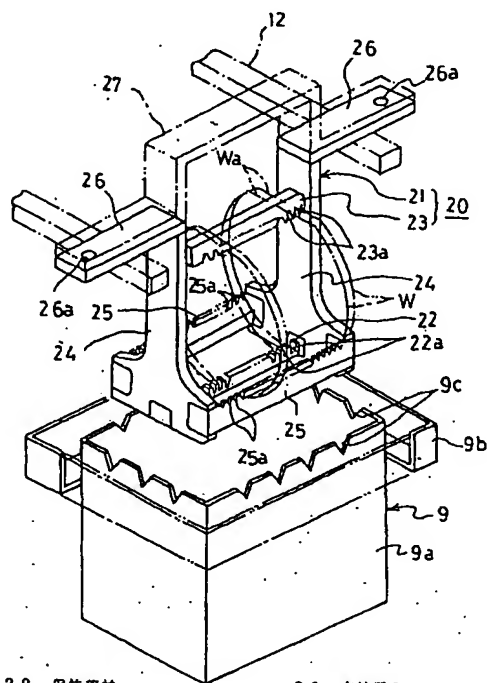
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(54) 【発明の名称】 洗浄処理装置

(57) 【要約】

【目的】 装置の小型化及び洗浄液の使用量の削減を図れるようにした洗浄処理装置を提供する。

【構成】 半導体ウエハWを洗浄するための処理槽9内に半導体ウエハWを搬入する支持手段20を、半導体ウエハWを保持する保持溝22aを所定ピッチで互いに平行に複数設けた保持部材22と、この保持部材22と対向する部位で半導体ウエハWを保持すべく保持部材22の保持溝22aと同じピッチの溝23aを有する押え部材23とで構成する。また、押え部材23を半導体ウエハWに係脱可能に形成する。これにより、半導体ウエハW間のピッチを可及的に小さくすることができる共に、半導体ウエハWを安定した状態で処理槽9内に搬送して洗浄処理することができる。



22 保持部材
22a 保持溝
W 半導体ウエハ

20 支持手段
21 ウエハキャリア
23 押え部材
23a 溝

【特許請求の範囲】

【請求項 1】 被洗浄基板を洗浄するための洗浄処理槽と、この洗浄処理槽内に上記被洗浄基板を搬入すべく被洗浄基板を支持する支持手段とを具備する洗浄処理装置において、

上記支持手段は、上記被洗浄基板を保持する保持溝を所定ピッチで互いに平行に複数設けた保持部材と、この保持部材と対向する部位で上記被洗浄基板を保持すべく保持部材の保持溝と同じピッチの溝を有する押え部材とを具備し、かつ、上記押え部材を上記被洗浄基板に係脱可能に形成したことを特徴とする洗浄処理装置。

【請求項 2】 被洗浄基板を洗浄するための洗浄処理槽と、この洗浄処理槽内に上記被洗浄基板を搬入又は搬出する搬入・搬出手段と、上記洗浄処理槽内に搬入された被洗浄基板を支持する支持手段とを具備する洗浄処理装置において、

上記支持手段は、上記被洗浄基板を保持する保持溝を所定ピッチで互いに平行に複数設けた保持部材と、この保持部材と対向する部位で上記被洗浄基板を保持すべく保持部材の保持溝と同じピッチの溝を有する押え部材とを具備し、かつ、上記押え部材を上記被洗浄基板に係脱可能に形成したことを特徴とする洗浄処理装置。

【請求項 3】 保持部材の保持溝と押え部材の溝を、それぞれ被洗浄基板の端部両面を保持する溝基部と、この溝基部の開口端の一辺に拡開する傾斜案内部とで構成し、この際、対向する上記保持溝と溝における対角線上の対称位置側の辺に上記傾斜案内部を設けたことを特徴とする請求項 1 又は 2 記載の洗浄処理装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 この発明は、被洗浄基板を所定の洗浄液に浸漬して洗浄処理する洗浄処理装置に関するものである。

【0002】

【従来の技術】 一般にこの種の洗浄処理装置は、被洗浄基板、例えば半導体ウエハ（以下にウエハという）をアンモニア、フッ酸及び純水等の処理液に順次浸漬してウエハの表面を洗浄処理するものである。

【0003】 従来、この種の洗浄処理装置として、複数枚例えば 25 枚のウエハを収容したウエハキャリア毎搬送して、洗浄処理槽に順次浸漬して洗浄するように構成された洗浄処理装置と、ウエハキャリアから取り出された複数枚例えば 25 枚のウエハをウエハ搬送アームで各洗浄処理槽等に搬送し、各洗浄処理槽に配設されたウエハポート（ウエハ支持手段）に受け渡して洗浄処理するいわゆるキャリアレスの洗浄処理装置が知られている。

【0004】 ところで、近年半導体デバイスは高集積化される傾向にあり、その回路パターンは益々微細化されつつある。また、半導体ウエハは、例えば 6 インチから 8 インチへと大口径化される傾向にある。このような大

口径例えば 8 インチ径のウエハを収容するウエハキャリアは、汎用性を高めるために通常統一されたピッチ例えば 6.35 mm（6 インチ径のウエハでは 4.76 mm）で 25 枚のウエハを保持するように構成されている。このため、ウエハをウエハキャリア毎搬送し、洗浄処理槽等に順次浸漬する前者の洗浄処理装置においては、洗浄処理槽が大型化し、装置全体が大型となると共に、純水の使用量が高むという問題があった。

【0005】 上記問題を解決するために、出願人は、ウエハ支持手段にウエハキャリアのピッチより狭いピッチのウエハ載置溝を設けることで、装置の小型化及び洗浄液等の消費量の削減を図れるようにした洗浄装置を開発した（特開平 5-129267 号公報参照）。

【0006】

【発明が解決しようとする課題】 しかしながら、ウエハのピッチを余り小さくすると、搬送中にウエハが揺れ易くなって不安定な状態となり、図 13 に示すように、搬送中にウエハ W が傾いたり隣接するウエハ同士が接触するという問題があった。また、隣接するウエハ同士の間隔が狭いため、ウエハとウエハとの間に、表面張力によりウエハ W、W 間に洗浄液 L が溜ってしまい、洗浄処理槽からウエハ W を引き上げた後もウエハ W に洗浄液 L が付着して、洗浄処理に支障をきたすという問題もあった。このような現象は、特に親水性の洗浄液の場合に多く、ウエハ間のピッチが 4.8 mm 以下になると顕著に現れる。したがって、ウエハ間のピッチを余り狭くすることはできず、装置の小型化及び洗浄液の使用量の削減を充分満足できるまでには至っていないのが現状である。なお、キャリアレス式の洗浄処理装置においては、ウエハキャリア毎搬送する洗浄処理装置に比較して多少ウエハキャリアの容積分洗浄処理槽を小さくすることができ、洗浄液の使用量の削減が図れるが、上述したようにウエハ支持部のピッチに限界があるため、これにおいても上述のように装置の小型化及び洗浄液の使用量の削減を充分満足できるまでには至っていない。

【0007】 この発明は上記事情に鑑みなされたもので、被処理基板間のピッチを可及的に小さくすると共に、被洗浄基板を安定な状態に支持して洗浄処理を施すことができ、装置の小型化及び洗浄液の使用量の削減を図れるようにした洗浄処理装置を提供することを目的とするものである。

【0008】

【課題を解決するための手段】 上記目的を達成するために、この発明の第 1 の洗浄処理装置は、被洗浄基板を洗浄するための洗浄処理槽と、この洗浄処理槽内に上記被洗浄基板を搬入すべく被洗浄基板を支持する支持手段とを具備する洗浄処理装置を前提とし、上記支持手段は、上記被洗浄基板を保持する保持溝を所定ピッチで互いに平行に複数設けた保持部材と、この保持部材と対向する部位で上記被洗浄基板を保持すべく保持部材の保持溝と

同じピッチの溝を有する押え部材とを具備し、かつ、上記押え部材を上記被洗浄基板に係脱可能に形成したことを特徴とするものである（請求項1）。

【0009】また、この発明の第2の洗浄処理装置は、被洗浄基板を洗浄するための洗浄処理槽と、この洗浄処理槽内に上記被洗浄基板を搬入又は搬出する搬入・搬出手段と、上記洗浄処理槽内に搬入された被洗浄基板を支持する支持手段とを具備する洗浄処理装置を前提とし、上記支持手段は、上記被洗浄基板を保持する保持溝を所定ピッチで互いに平行に複数設けた保持部材と、この保持部材と対向する部位で上記被洗浄基板を保持すべく保持部材の保持溝と同じピッチの溝を有する押え部材とを具備し、かつ、上記押え部材を上記被洗浄基板に係脱可能に形成したことを特徴とするものである（請求項2）。

【0010】この発明において、上記保持部材の保持溝と押え部材の溝は同ピッチに形成されていれば、その形状は任意でよいが、好ましくは、保持部材の保持溝と押え部材の溝を、それぞれ被洗浄基板の端面両面を保持する溝基部と、この溝基部の開口端の一辺に拡開する傾斜案内内部とで構成し、この際、対向する上記保持溝と溝における対角線上の対称位置側の辺に上記傾斜案内内部を設ける方がよい（請求項3）。

【0011】

【作用】上記のように構成されるこの発明の洗浄処理装置によれば、支持手段は、被洗浄基板を保持する保持溝を所定ピッチで互いに平行に複数設けた保持部材と、この保持部材と対向する部位で被洗浄基板を保持すべく保持部材の保持溝と同じピッチの溝を有する押え部材とを具備し、押え部材を被洗浄基板に係脱可能に形成することにより、保持部材と押え部材とで被洗浄基板の対向部位を保持することができるので、被洗浄基板は搬送中に不用意に揺れ動くことはなく安定した状態で所定の場所に搬送される。また、洗浄処理中に、洗浄液の表面張力の作用により被洗浄基板が撓むことを防止することができるので、隣接する被洗浄基板同士間に洗浄液が溜まることのない。したがって、被洗浄基板間のピッチを可及的に小さくすることができ、装置の小型化及び洗浄液の使用量の削減を図ることができる（請求項1及び2）。

【0012】また、保持部材の保持溝と押え部材の溝を、それぞれ被洗浄基板の端面両面を保持する溝基部と、この溝基部の開口端の一辺に拡開する傾斜案内内部とで構成すると共に、対向する保持溝と溝における対角線上の対称位置側の辺に傾斜案内内部を設けることにより、被洗浄基板は傾斜案内内部に案内されて溝基部に容易かつ確実に保持される。また、傾斜案内内部は対向する保持溝と溝の対角線上の対称位置の辺のみに設けられているので、保持溝及び溝のピッチを更に可及的に小さくすることができ、更に、装置の小型化及び洗浄液の使用量の削減を図ることができる（請求項3）。

【0013】

【実施例】以下にこの発明の実施例を図面に基いて詳細に説明する。この実施例では半導体ウエハの洗浄処理装置に適用した場合について説明する。

【0014】◎第一実施例

図1はこの発明の洗浄処理装置の第一実施例の概略斜視図、図2は被洗浄基板の搬送及び処理状態の斜視図が示されている。

【0015】半導体ウエハの洗浄処理装置は、図1に示すように、未処理の被洗浄基板である半導体ウエハ（以下にウエハという）Wを収容する搬入部1と、ウエハWの洗浄処理を行う洗浄処理部2と洗浄後のウエハWを収容する搬出部3とで主要部が構成されている。

【0016】搬入部1は、洗浄処理前の所定枚数例えば25枚のウエハWを収容するカセット4を待機させる待機部5と、カセット4からのウエハWの取り出し、ウエハW間のピッチを所定のピッチに変換してウエハ支持手段20を構成するウエハキャリア21に移載するピッチ変換機構6と、外部から搬送ロボットなどによって搬入されるカセット4の待機部5への移送及びこの待機部5とピッチ変換機構6との間でカセット4の移送を行うためのカセット搬送アーム7とを具備してなる。

【0017】洗浄処理部2には、搬入部1から搬出部3に向かって直線状に順に、ウエハキャリア搬送用のチャック12を洗浄・乾燥する第1のチャック洗浄・乾燥処理室8a、ウエハW表面の有機汚染物、金属不純物、パーティクル等の不純物質を薬液によって洗浄処理する第1の薬液処理室8b、第1の薬液処理室8bで洗浄されたウエハWを例えば純水によって洗浄する2つの水洗処理室8c、8d、第1の薬液処理室8bの薬液とは異なる薬液で洗浄する第2の薬液処理室8e、第2の薬液処理室8eで洗浄されたウエハWを例えば純水によって洗浄する2つの水洗処理室8f、8g、チャック12を洗浄・乾燥する第2のチャック洗浄・乾燥処理室8h及び上記不純物質が除去されたウエハWを例えばIPA（イソプロピルアルコール）等で蒸気乾燥させるためのウエハ乾燥処理室8iが配設されている。これら各洗浄処理室（以下、単に処理室という）8a～8h内には、それぞれ処理槽9が配設されている。

【0018】また、洗浄処理部2の側方には、各処理室8a～8iに沿って配設された案内内部10と、この案内内部10に装着されて水平（X方向）及び垂直（Z方向）に移動自在な3基のウエハキャリア搬送ブロック11とで構成されるウエハキャリア搬送装置15が設けられている。ウエハ搬送ブロック11には、複数枚のウエハWを適宜間隔をおいて列設支持するウエハキャリア21を保持するチャック12が設けられており、このチャック12にて保持されるウエハキャリア21とウエハWが各処理室8a～8iに搬送されるように構成されている。

【0019】なお、洗浄処理部2の上方には空キャリア

及び滴杯キャリアを搬送するキャリア搬送部 13 が設けられている。また、洗浄処理部 2 の背面側には薬液等の処理液を収容するタンクや配管群を含む処理液・配管収容室 14 が設けられている。

【0020】上記ウエハ支持手段 20 は、ウエハ W を保持する保持溝 22 a を所定ピッチで互いに平行に複数設けた保持部材 22 を有するウエハキャリア 21 と、保持部材 22 と対向する部位でウエハ W を保持すべく保持部材 22 の保持溝 22 a と同じピッチの溝 23 a を有するウエハ W に対して着脱可能に係合する押え部材 23 とで

構成されている。

【0021】この場合、ウエハキャリア 21 は、図 2 及び図 3 に示すように、略逆 T 字形の一对の支持板 24 の下部中央間に保持部材 22 を横架し、保持部材 22 に関して両側のやや上部間に補助保持部材 25 を横架してなり、かつ、支持板 24 の上部端にそれぞれ外向きのフランジ部材 26 を突設してなる。フランジ部材 26 には取付孔 26 a が設けられており、このフランジ部材 26 の上に載置されるハット状の把持治具 27 を図示しないボルト等にて固定してウエハキャリア 21 を作業者が手に

持って搬送できるように構成されている。このように構成されるウエハキャリア 21 の各構成部材は、耐薬品性、耐蝕性に優れた例えば石英製部材にて形成されている。なお、保持部材 22 及び補助保持部材 25 は支持板 24 に溶接等によって固定されている。

【0022】また、保持部材 22 に設けられる保持溝 22 a は、図 4 に示すように、ウエハ W の両端面を保持する断面コ字状の溝基部 30 と、溝基部 30 の開口端の両辺に拡開状に切りかけられる傾斜案内部 31 とで構成されている。このように保持溝 22 a を形成することにより、ウエハキャリア 21 に搬入されるウエハ W の端部を傾斜案内部 31 の傾斜面に案内させて溝基部 30 内に確実に案内してウエハ W を保持することができる。なお、補助保持部材 25 には、図 5 に示すような三角形の保持溝 25 a が保持部材 22 の保持溝 22 a と同じピッチに設けられている。

【0023】一方、上記押え部材 23 は、耐食、耐熱及び耐強度性に優れている例えばポリエーテルエーテルケトン (Polyetheretherketone; PEEK) 製部材にて形成されており、また、押え部材 23 は、フッ素樹脂製部材、石英製部材でもよく、この押え部材 23 に設けられる溝 23 a は、保持部材 22 の保持溝 22 a と同様に、ウエハ W の両端面を保持する断面コ字状の溝基部 30 と、溝基部 30 の開口端の両辺に拡開状に切りかけられる傾斜案内部 31 とで構成されている (図 5 参照)。このように溝 23 a を形成することにより、ウエハキャリア 21 に搬入され、保持部材 22 及び補助保持部材 25 によって保持されたウエハ W の上部のオリエンテーションフラット部 Wa を傾斜案内部 31 の傾斜面が案内して溝基部 30 内に確実に案内してウエハ W の上端部を保持す

ることができる。

【0024】このように構成される押え部材 23 は、上記ピッチ変換機構 6 の近傍位置に設けられた押え部材搬送機構 40 によってウエハキャリア 21 に移載されたウエハ W の上部のオリエンテーションフラット Wa 部に係脱可能に形成されている。押え部材搬送機構 40 は、例えば、図 3 に示すように、先端に押え部材 23 の吸着部 41 を有する中空パイプ状の押え部材保持アーム 42 を、図示しない起倒手段によってウエハキャリア 21 の側方からウエハキャリア 21 に向って起倒可能に支承し、押え部材保持アーム 42 の基部に真空装置 (図示せず) を接続してなる。

【0025】このように構成される押え部材搬送機構 40 は、ウエハキャリア 21 にウエハ W が搬入又はウエハキャリア 21 からウエハ W が搬出される際、真空装置の駆動によって押え部材 23 を吸着保持して待機位置 (図 3 の実線位置) に起立してウエハ W の搬入・搬出の邪魔にならないようになっている。そして、ウエハキャリア 21 にウエハ W が搬入されて、保持部材 22 及び補助保持部材 25 によってウエハ W が保持された後、押え部材保持アーム 42 がウエハ W 上部側に回転して押え部材 23 の溝 23 a 内にウエハ W のオリエンテーションフラット部 Wa を係合させ、その後、真空装置の駆動を停止して吸着部 41 による押え部材 23 の吸着を解除した後、押え部材保持アーム 42 を待機位置に後退させる。

【0026】したがって、ウエハキャリア 21 に搬入されたウエハ W は保持部材 22 及び補助保持部材 25 によって下部が保持されると共に、押え部材 23 によって上部のオリエンテーションフラット部 Wa が保持されるので、搬送中に揺れて傾いたり隣接するウエハ W、W 同士が接触することがない上、洗浄処理中に、洗浄液の表面張力によってウエハ W が撓んで隣接するウエハ W、W 間に洗浄液が溜まったりウエハ W が接触するなどの問題がない。

【0027】なお、上記説明では、保持部材 22 の保持溝 22 a と押え部材 23 の溝 23 a を、ウエハ W の両端面を保持する断面コ字状の溝基部 30 と、溝基部 30 の開口端の両辺に拡開状に切りかけられる傾斜案内部 31 とで構成した場合について説明したが、必しもこのような構造とする必要はなく、図 6 に示すように、保持部材 22 の保持溝 22 a と押え部材 23 の溝 23 a を、それぞれウエハ W の両面を保持するコ字状の溝基部 32 と、この溝基部 32 の開口端の一辺に拡開する傾斜案内部 33 とで構成し、この際、対向する保持溝 22 a と溝 23 a における対角線上の対称位置側の辺に傾斜案内部 33 を設けるようにしてもよい。

【0028】このように保持溝 22 a と溝 23 a を構成することにより、溝間のピッチ P を可及的に小さくすることができると共に、ウエハ W の保持を容易かつ確実に

てウエハWの溝内への挿入を容易にすることができ、対角線上に対向する傾斜案内部33と反対側の溝基部32の側壁34によってウエハWの対向する端部を確実に保持することができる。このように保持溝22aと溝23aを構成することによって溝間ピッチPを約2mmまで小さく設定することが可能である。

【0029】上記ピッチ変換機構6は、図7に示すように、ウエハ移載機構60と、1/2ピッチウエハガイド61（具体的にはウエハキャリア21にて形成する）とで構成されている。この場合、ウエハ移載機構60は、肉厚の薄い櫛状の支持部62によって両側から各ウエハWの周縁部を把持するように構成されており、これらの支持部62は、通常ピッチ（8インチ径のウエハでは6.35mm）で形成されている。一方、1/2ピッチウエハガイド61は、通常ピッチの1/2すなわち3.175mmピッチでウエハWを支持することができるように形成されたウエハ支持溝63を具備している。

【0030】このように構成されるピッチ変換機構6を用いてウエハ間のピッチを変換するには、まず、ウエハ移載機構60によって1つのカセット*内に収容されたウエハWを把持し、搬送して1/2ピッチウエハガイド61に載置する。この状態では、1/2ピッチウエハガイド61のウエハ支持溝63に1つおきにウエハWが配置される。

【0031】次に、図示矢印Aのように、1/2ピッチウエハガイド61を、1/2ピッチすなわち3.175mmだけ水平方向に移動させ、この後、ウエハ移載機構60によって、もう1つのカセット4内に収容されたウエハWを把持し、搬送して1/2ピッチウエハガイド61のウエハW間に挿入・載置する。これにより、1/2ピッチウエハガイド61すなわちウエハキャリア21上に、50枚のウエハWが3.175mmピッチで配置される。そして、上述したように、押え部材搬送機構40によって押え部材23がウエハキャリア21に搬入されたウエハWの上部すなわちオリエンテーションフラットWaに移動してウエハWの上端部を同様に3.17mmピッチに保持する。

【0032】なお、上記説明では、8インチ径のウエハWを通常のピッチの1/2ピッチとする場合について説明したが、他の径例えば6インチ径のウエハに対しても同様に適用することができ、また、ピッチは通常のピッチの1/2に限らず、通常のピッチより小さなピッチ例えば4.8mm、3.5mmあるいは2.0mm等適宜選択することができる。この場合、ウエハWのピッチを1/2ピッチ以外とするには、例えば図8に示すようなピッチ変換機構6を使用することができる。すなわち、このピッチ変換機構6は、図9に示すように、上部が通常ピッチPa（例えば6.35mm）、下部が所望ピッチPb（例えば4.8mm、3.5mmあるいは2.0mm）とされ、上部から下部に向けて徐々にピッチが狭

くなるように形成されたウエハ支持溝64を有し、両側からウエハWの周縁部を把持するウエハ支持機構65と、所望ピッチPb（例えば4.8mm、3.5mmあるいは2.0mm）でウエハWを支持するウエハガイド66（具体的にはウエハキャリア21にて形成される）とで構成されている。

【0033】このように構成された所望ピッチ変換機構6を用いてウエハ間隔のピッチを1/2ピッチ以外とするには、まず、通常ピッチで配列されたウエハWを、ウエハ支持機構65の上部で支持し、これらのウエハWをウエハガイド66の上部に搬送する。そして、徐々にウエハ支持機構65の間隔を広げていくことにより、ウエハWがウエハ支持溝64内を滑るように落下するようにして、所望ピッチに変換する。そして、この状態でウエハガイド66（具体的にはウエハキャリア21）上に載置する。このようなピッチ変換機構6を用いれば、通常ピッチの1/2ピッチに限らず、所望のピッチに変換することができる。

【0034】なお、上記第1及び第2の薬液処理室8b及び8eにおける処理槽9は、図2及び図10に示すように、処理槽本体9aの上部開口の外周部に外槽9bを設けてなり、処理槽本体9aの開口部に設けられた切欠き9cを介して処理槽本体9aからオーバーフローした薬液L（洗浄液）を外槽9bで受け止めるように構成されている。また、処理槽本体9aの底部と外槽9bの底部には循環管路9dが接続されており、この循環管路9dに介設されるポンプ9e、バルブ9f及びフィルタ9gを介して外槽9bにオーバーフローされた薬液Lが処理槽本体9a内に循環供給されるように構成されている。一方、上記4つの水洗処理室8c、8d、8f及び8gの処理槽9は、図11に示すように、洗浄処理層9の底部に純水供給兼排水管9hを接続してなり、図示しない純水供給源から多量の純水を洗浄処理層9内に供給し、所定時間経過後、短時間で処理後の純水を一度に排水するいわゆるクイックダンプ方式が採用されている。

【0035】次に、この発明の洗浄処理装置の動作について説明する。まず、上記ピッチ変換機構6によって所望のピッチに変換されたウエハWをウエハキャリア21に搬送して保持部材22の保持溝22a及び補助保持部材25の保持溝25aにて保持した後、押え部材搬送機構40によって押え部材23をウエハWのオリエンテーションフラットWaに係合させて、ウエハWの上部を保持する。

【0036】次に、チャック12によってウエハキャリア21を第1の薬液処理室8bに搬送して、処理槽9内の薬液にウエハキャリア21及びウエハWを所定時間浸漬して、ウエハW表面の有機汚染物、金属不純物、パーティクル等の不純物質を薬液によって洗浄処理する。次に、ウエハキャリア21を水洗処理室8c及び8dに順次搬送し、処理槽9内の純水に浸漬して第1の処理室8

bで使用された薬液を除去する。次いで、ウエハキャリア21を第2の薬液処理室8eに搬送して、処理槽9内の薬液にウエハキャリア21及びウエハWを所定時間浸漬して、第1の薬液処理室8bの薬液とは異なる薬液でウエハWを洗浄する。そして、第2の薬液処理室8eで洗浄されたウエハWを、水洗処理室8f及び8gに順次搬送して洗浄した後、ウエハキャリア21をウエハ乾燥処理室8iに搬送して、不純物質が除去されたウエハWを例えばIPA（イソプロピルアルコール）等で蒸気乾燥する。この際、ウエハWにおける押え部材23が接触する部分にIPA蒸気の染み模様等が生じるので、これを防止するために、押え部材23をウエハWから取り外してウエハキャリア21をウエハ乾燥処理室8i内に搬送して乾燥処理する方が好ましい。

【0037】上述のようにして洗浄処理及び乾燥処理が行われたウエハWは搬出部3に搬送されてピッチ変換機構6によって上述したとは逆の動作によって、ピッチ変換され、2つのカセット4内に通常のピッチ例えば6.35mmピッチで25枚ずつ収容される。

【0038】したがって、ウエハWは保持部材22と押え部材23とで保持された状態で搬送されるので、搬送中に揺れ動いて傾いたり、隣接同士が接触することがない。また、小ピッチ間隔を保持した状態でウエハWを洗浄処理することができるので、洗浄処理中にウエハWの上部が洗浄液の表面張力によって撓むようなことがなく、隣接するウエハ間に洗浄液が溜ったりウエハ同士が接触するのを防止することができる。更に、小ピッチ間隔でウエハWを保持することで、処理槽9を小型化することができ、その結果、水洗処理においては、純水中のイオンの比抵抗の立ち上がりが早くなり、リンス効率が向上すると共に、リンス時間（洗浄処理時間）が短縮化できるばかりでなく、純水の使用量を低減することができる。

【0039】◎第二実施例

図10は洗浄処理装置の第二実施例の要部の概略断面図が示されている。

【0040】第二実施例は、この発明の洗浄処理装置を、上記第一実施例のウエハキャリア21を用いずに、直接洗浄処理室に搬送するいわゆるキャリアレス式の洗浄処理装置に適用した場合である。

【0041】すなわち、待機部5のカセット4内に収容されているウエハWを、上記第一実施例と同様に構成されるピッチ変換機構6によって所望のピッチに変換されたウエハWをウエハガイド66に移載した後、上記第一実施例のチャック12と同様に配設された搬入・搬出手段としてのウエハチャック16によってピッチ変換されたウエハWを把持して各洗浄処理室にウエハWを搬送して、洗浄処理するようにした場合である。

【0042】この第二実施例において、各処理槽9にはウエハチャック16から受け渡されたウエハWを保持す

る支持手段20が配設されている。この支持手段20は、上記第一実施例のウエハキャリア21と同様に、略逆T字形の一对の支持板54と、これら支持板54に横架される1つの保持部材52と、保持部材52の両側に横架される2つの補助保持部材55とを有して各処理槽9内を昇降移動するウエハポート51と、各処理槽9の側方に配設された押え部材搬送機構40によってウエハポート51に保持されたウエハWの上部に係脱可能に形成される上記第一実施例と同様の押え部材23とで構成されている。なお、第二実施例において、その他の部分は上記第一実施例と同じであるので、同一部分には同一符号を付して、その説明は省略する。

【0043】上記のように構成することにより、ウエハチャック16にて搬送されるウエハWは、各処理室のウエハポート51の保持部材52及び補助保持部材55の保持溝52a、55aに受け渡された後、押え部材搬送機構40の駆動により押え部材23がウエハWの上部に移動してオリエンテーションフラットWa部に押え部材23の溝23aに係合させることで、ウエハWの上部及び下部を所定の小ピッチ間隔で整列保持することができる。この状態で洗浄処理を施すことができる。

【0044】したがって、小ピッチ間隔を保持した状態でウエハWを洗浄処理することができるので、洗浄処理中にウエハWの上部が洗浄液の表面張力によって撓むようなことがなく、隣接するウエハ間に洗浄液が溜ったりウエハ同士が接触するのを防止することができる。また、上記第一実施例と同様に、リンス時間（洗浄処理時間）が短縮化できると共に、純水の使用量を低減することができる。

【0045】なお、上記実施例では、この発明の洗浄処理装置を半導体ウエハの洗浄処理装置に適用した場合について説明したが、半導体ウエハ以外のガラス基板あるいはLCD基板等の被洗浄基板の洗浄処理装置にも適用できることは勿論である。

【0046】

【発明の効果】以上に説明したようにこの発明の洗浄処理装置によれば、上記のように構成されているので、以下のような効果が得られる。

【0047】1）保持部材と押え部材とで被洗浄基板の対向部位を保持するので、被洗浄基板を安定した状態で処理槽内に搬送して洗浄処理することができ、しかも、被洗浄基板間のピッチを可及的に小さくすることができるので、装置の小型化及び洗浄液の使用量の削減を図ることができる。

【0048】2）保持部材の保持溝と押え部材の溝を、それぞれ被洗浄基板の両面を保持する溝基部と、この溝基部の開口端の一辺に拡開する傾斜案内部とで構成すると共に、対向する保持溝と溝における対角線上の対称位置側の辺に傾斜案内部を設けることにより、被洗浄基板を容易かつ確実に保持することができる。また、傾斜案

内部は対向する保持溝と溝の対角線上の対称位置の辺のみに設けられているので、保持溝及び溝のピッチを更に可及的に小さくすることができ、更に、装置の小型化及び洗浄液の使用量の削減を図ることができる。

【図面の簡単な説明】

【図 1】 この発明の洗浄処理装置を適用した半導体ウエハ洗浄処理装置の一例を示す概略斜視図である。

【図 2】 この発明の洗浄処理装置の第一実施例における被洗浄基板の搬送及び処理状態を示す斜視図である。

【図 3】 第一実施例の支持手段の概略断面図である。 10

【図 4】 第一実施例の保持部材と押え部材の保持状態を示す断面図である。

【図 5】 この発明における補助保持部材の溝を示す拡大断面図である。

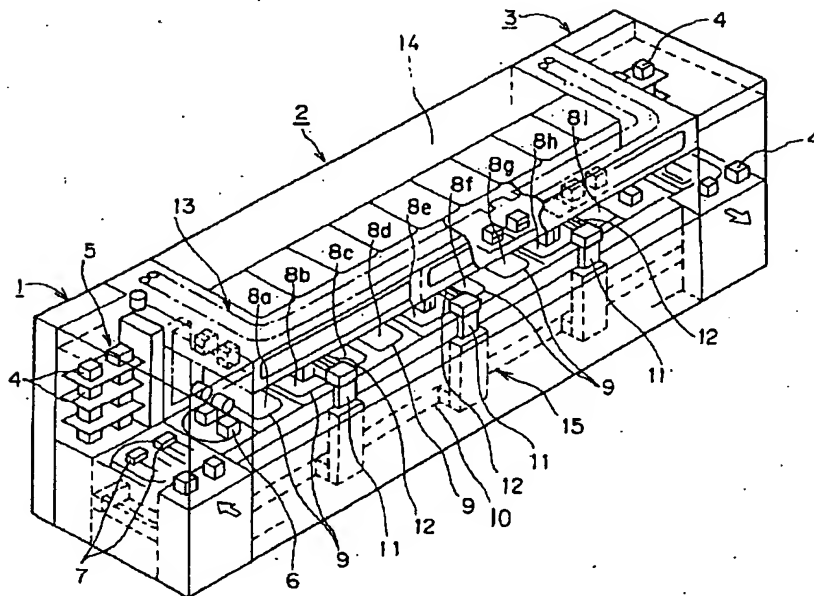
【図 6】 この発明における保持部材と押え部材の別の保持形態を示す断面図である。

【図 7】 この発明におけるピッチ変換機構を示す概略斜視図である。

【図 8】 ピッチ変換機構の別の構成を示す概略斜視図である。 20

【図 9】 図 8 のピッチ変換機構の要部を示す概略側面図

【図 1】



である。

【図 10】 この発明における処理槽の一例の概略断面図である。

【図 11】 処理槽の別の一例を示す概略断面図である。

【図 12】 この発明の第二実施例の要部断面図である。

【図 13】 従来の洗浄処理装置における被洗浄基板の保持状態を示す概略断面図である。

【符号の説明】

W 半導体ウエハ (被洗浄基板)

12 ウエハキャリア搬送用チャック

16 ウエハチャック (搬入・搬出手段)

20, 50 支持手段

21 ウエハキャリア

22, 52 保持部材

22a, 52a 保持溝

23 押え部材

23a 溝

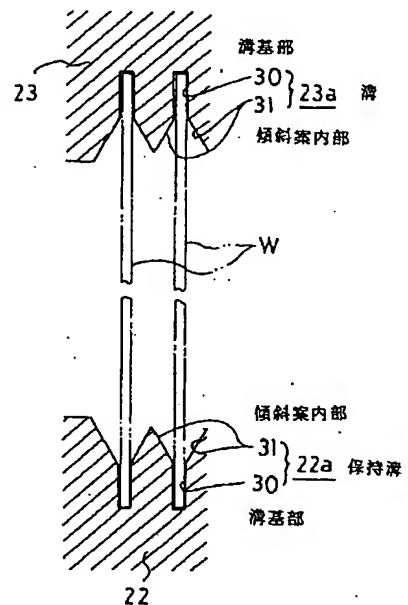
30, 32 溝基部

31, 33 傾斜案内内部

34 側壁

51 ウエハポート

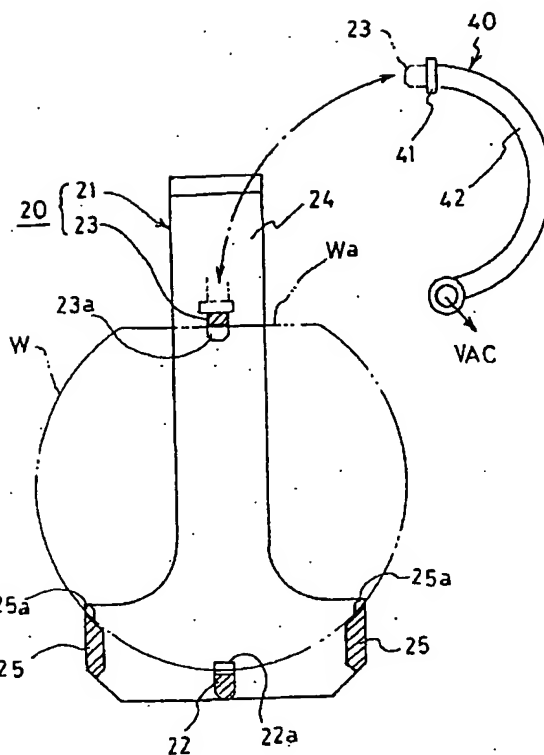
【図 4】



【図 5】

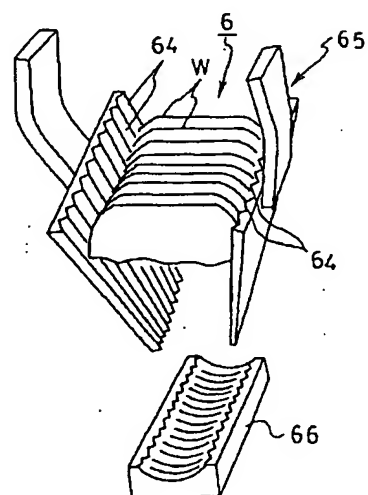
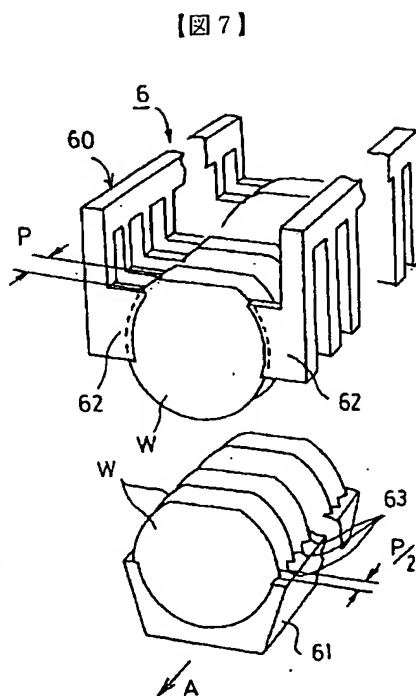


【図 3】

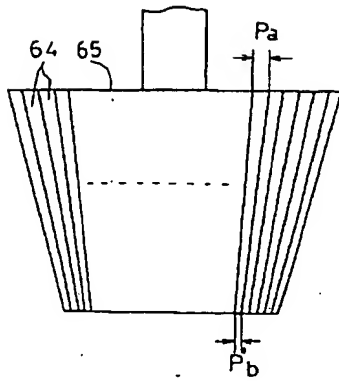


20 支持手段
21 ウエハキナリ了
23 押え部材
23a 溝

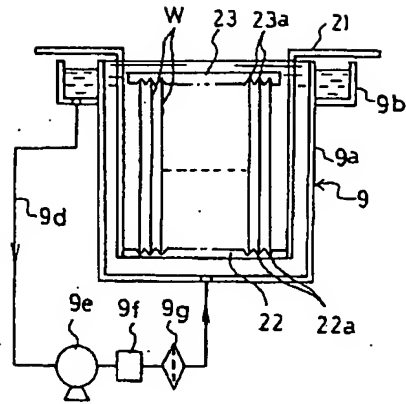
【图 8】



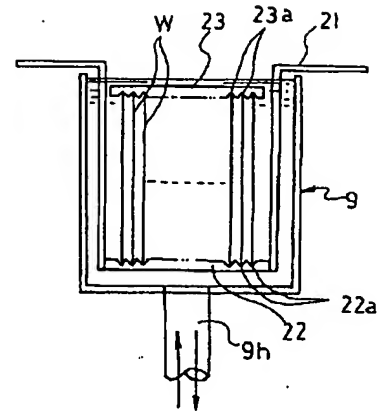
【図9】



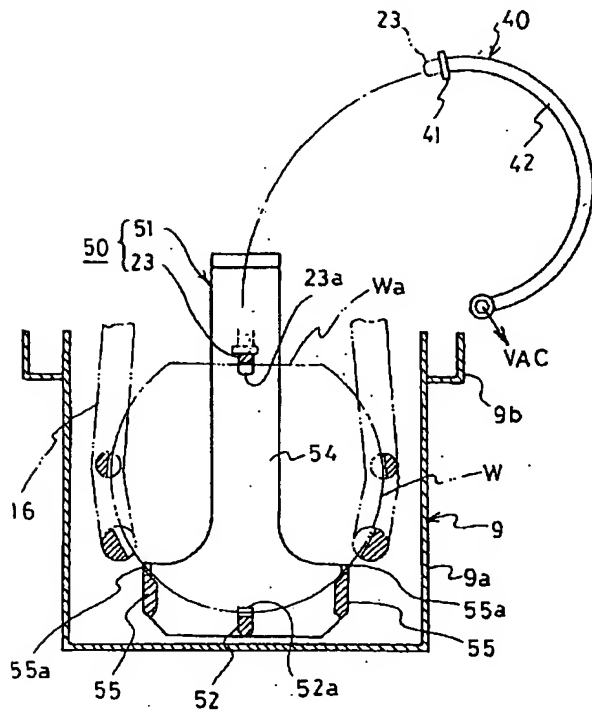
【図10】



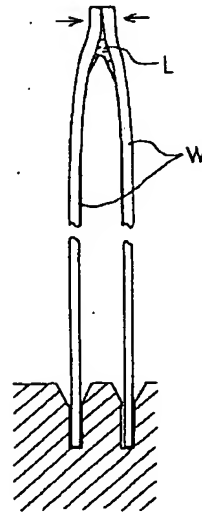
【図11】



【図12】



【図13】



- | | |
|------------|-----------|
| 16 ウエハチャック | 51 ウエハポート |
| 23 押え部材 | 52 保持部材 |
| 50 支持手段 | 52a 保持溝 |

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